

employment of women as health visitors or in other ways in connection with the carrying out of provisions for public health also appeared on more than one occasion.

Subjects to be treated from the more specially scientific standpoint fall, as a rule, to Section I., sanitary science and preventive medicine, or to Section III., physics, chemistry, and biology. In the former, Fleet-Surgeon Bassett-Smith suggested various ways in which disease might be disseminated in a paper on present knowledge of the etiology of Mediterranean fever, with special reference to the Royal Navy. The other papers were by Dr. R. S. Marsden, on scarlatina and certain other diseases in relation to temperature and rainfall; by Dr. J. Fletcher, on post-scarlatina diphtheria and its prevention; and by Dr. F. T. Bond, on some points of interest in the treatment of outbreaks of diphtheria. In Section III., besides the discussion on the influence of dust, may be mentioned a paper by Prof. M. Travers, F.R.S., on the absorption of gases in solids, which showed how, following the analogy of the absorption of carbonic anhydride by carbon, the absorption of water vapour by wool and by cotton varied with the pressure of the vapour up to saturation point, and also how the absorption of water vapour by cotton at the same pressure diminished with increase of temperature.

Mr. J. H. Johnston described some experiments upon the determination of the amount of organic colloids in sewage and their partial removal by surface action. Mr. J. W. Lovibond sought for a more precise chemical definition of "pure beer," and indicated the use of his tintometer to identify the quality of beers. Dr. Rideal described the effect of copper sulphate in preventing the growth of algae in water supplies, and proposed the use of electrolytic chlorine for the purpose. The other papers were of a technical character.

In an evening lecture Prof. Lloyd Morgan set forth very clearly the distinction to be drawn between the deterioration of the individuals composing a race and the degeneration of the stock, and dealt with the bearing of the theory of evolution upon the question of degeneration. A popular evening lecture was also given by Baillie Anderson, of Glasgow, on the wastage of human life.

Ample provision was made for the entertainment of those attending the congress by visits to works and institutions in the neighbourhood, as well as by garden-parties or excursions to the numerous places of interest in the district. The excellence of the arrangements and the smoothness of the working were effective testimony to the admirable organisation of the congress as carried out by a local committee with Councillor Colston Wintle as chairman and Mr. T. J. Moss-Flower as secretary, in conjunction with the officers of the Sanitary Institute, of whom Colonel Lane Notter is chairman of council, Mr. W. Whittaker, F.R.S., chairman of the congress committee, and Mr. E. White-Wallis secretary.

#### MIGRATIONS INTO NEARER AND FURTHER INDIA.<sup>1</sup>

It was philologists who first borrowed the name "Dravidian" from Sanskrit and applied it to a well-known family of languages, mostly spoken in southern India, but of which an interesting member, Brâhûi, is found far to the north-west, in Baluchistan. In the hills of Central India, to the north of the main Dravidian group, there is another and totally distinct family of languages which philologists call "Mundâ."

It happens that the speakers of the south-Indian Dravidian languages and the speakers of Mundâ languages possess a common ethnic type—nose thick and broad, low facial angle, thick lips, wide, fleshy face, low stature, figure squat and sturdy, skin dark, and so on. This ethnic type ethnologists have called "Dravidian," an unfortunate piece of nomenclature, for (1) if language can ever be taken as a criterion of race, speakers of Mundâ languages are certainly different in racial origin from the speakers of Dravidian, and (2) some speakers of Dravidian languages, the Brâhûis, do not possess the so-called Dravidian ethnic

type, but possess that of the Iranians. At any rate, if we put the Brâhûis out of consideration for the present, it is better to name the ethnic type "Mundâ-Dravidian," i.e. the type common to the people known as Mundâs and to the people known as "South-Indian Dravidians." The type is almost certainly a mixed one. Judging from the fact that all Mundâs possess it, and that it is not possessed by all Dravidians (witness the Brâhûis), the probability is that the Mundâ-Dravidian ethnic type belongs mainly to the Mundâs, and has been acquired through intermarriage by Dravidians originally endowed with a less persistent type.

When the Aryans entered India they found it inhabited by people of the Mundâ-Dravidian type. The Aryans were the more highly civilised, but as they migrated further and further into the country they intermarried with the people, and themselves commenced to acquire their physical characteristics while they retained their own language and customs, which they in turn imposed upon the Mundâ-Dravidas with whom they came in contact. We see traces of the same interchange occurring even at the present day between the Dravidians and the Mundâs. The Nahâls of the Mahâdeo Hills were once a Mundâ tribe. They came into contact with the relatively more civilised Dravidians, and adopted a mixed speech in which Dravidian predominated. Nowadays this tribe is coming under Aryan influence, and is adopting an Aryan language.

It is impossible to say whether the Mundâs or the Dravidians, or both, were aborigines of India or not. Assuming that the Dravidians were immigrants, the probability is that they entered the country from the south, and not from the north-west, as was maintained by Caldwell and others. Relationship has been alleged, with some appearance of truth, between the Dravidian languages and those of New Guinea and Australia. This subject has not yet been thoroughly gone into, and is at present under examination, but the above seems to be the conclusion which will most probably be reached.

As for the Mundâs, if they were immigrants, they must certainly have entered India proper from the north-east. Pater Schmidt, of Vienna, who attacked the question from without, and the Linguistic Survey of India, which has approached it from within, have arrived at the same result. There was once a race spread widely over Further India of which we find remains amongst the forest tribes of Malacca, in Pegu and Indo-China, and along the Mé-kong and Middle Salwin. The languages which they speak are members of what is known as the Môn-Khmêr family. Forms of speech closely connected with Môn-Khmêr are Nicobarese, Khasi (spoken in the central hills of Assam), and the various Mundâ tongues of India proper. That there is an ultimate connection between these widely separated languages must now be taken as firmly established by the latest researches of comparative philology. The matter admits of no further doubt. But this is not the limit of the discoveries. The languages of the Himalaya are, it is well known, Tibeto-Burman in character. Nevertheless, there are dialects spoken on the southern slope of these mountains, from Kanâwar in the Punjab almost to Darjeeling, which have a basis similar to this old Mundâ-Nicobar-Môn-Khmêr-Khasi language, that has been, so to speak, overwhelmed, but not entirely hidden, by a layer of Tibeto-Burman. Then, on the other side, Pater Schmidt has shown an intimate connection between Môn-Khmêr and the languages of the south-eastern Pacific, so that there is evidence to show the existence in very early times of a people and a group of speeches extending from the Punjab right across northern India and Assam down to the extreme south of Further India and Indo-China, and thence across Indonesia, Melanesia, and Polynesia up to Easter Island, which is not so very far from the coast of South America.

In India, Nearer and Further, the fate of these speeches has been the same. In Nearer India the Mundâ languages, which were certainly once spoken in the northern plains, have been driven to the hills by Dravidians or Aryans. In Assam and Burmah the Khasis and Môn-Khmêrs have been either driven to the hills, where they survive as islands in a sea of alien tongues, or else to the coast of Pegu by the Tibeto-Burmans, and in Indo-China the Môn-Khmêrs have again been driven to the sea-board by the Tais.

<sup>1</sup> Extension of part of a paper on "The Languages of India and the Linguistic Survey," read before the Society of Arts on March 15 by Dr. G. A. Grierson.

The earliest seat of the Tibeto-Burmans seems to have been the head-waters of the Yang-tse-kiang. From here they migrated in successive waves along the valleys of the great rivers of eastern India, the Salwin, the Irrawaddy, the Chindwin, and the Brahmaputra. The first three led them to Burmah, which they conquered, and where they founded a comparatively stable kingdom. Down the Brahmaputra they entered Assam, peopling the river valleys and the mountains in successive waves, failing only to occupy the Khasi Hills. Some of those who had entered Burmah settled in the Chin Hills, and, finding no room for expansion, were forced into becoming a backwash to the north, entering Assam from the south—tribe after tribe, in raid after raid—until the migration was stopped by the strong arm of British authority. Other Tibeto-Burmans went up the Brahmaputra into Tibet, which they peopled, getting as far west as Baltistan and Ladakh, and also occupying the Himalaya between Tibet and India proper. It was here that they found and partly gave their speech to the Mundá-Môn-Khmêr tribes already mentioned.

The most recent Indo-Chinese immigration was that of the Tais. They first appear in history in Yunnan, and thence they began to occupy Upper Burmah some two thousand years ago. A great wave of immigration occurred in the sixth century A.D. Not only did they effectively conquer Upper Burmah, but they invaded Assam. They peopled the Shan States, and in the fourteenth century established themselves in the delta of the Mé-nam, driving the Môn-Khmêrs before them so as to form a Tai wedge between those of Tenasserim and those of Cambodia. This was the foundation of the Tai (or Thai) kingdom of Siam. At the present day the Tais are represented in British India by the Shans, the Khamtis, and other tribes of north Burmah and Assam.

A few words may be devoted to the latest great migration into India proper, that of the Aryans from the north-west. We cannot tell when this commenced. All that we can say is that parts of their earliest literary record, the Vêda, which was composed in the Punjab, have been considered by competent scholars to date from so far back as B.C. 2000, while others date them a thousand years later. The main line of approach was over the most western passes of the Hindu Kush, and along the valley of the Kabul River into the Punjab. Thence they spread over northern India. The entry into the Punjab was a very gradual one, extending over centuries. When the latest comers arrived they found that the language and the customs of their earliest predecessors had developed to such an extent that the former was unintelligible, and the latter were unsympathetic to them. This is reflected in the condition of the Aryan languages of India from the earliest times to the present day. There have always been two sharply differentiated groups of Indo-Aryan languages, one representing the speech of the earliest invaders, and the other that of the latest, while between the two there is a band of intermediate forms of speech which can be referred to the dialects spoken by those who were neither first nor last.

Some Aryan hordes entered the western Punjab from the Pamirs directly to the north. Most of these settled *en route* in the country round Gilgit, Kashmir, Chitral, and in Kâfiristân. Here the inhospitable character of the mountains in which they took up their abode, and their own savage nature, hindered communication with their cousins in the plains, and their customs and language developed on independent lines. The latter presents extremely archaic features. Words which were used three thousand years ago in India proper, and which have since fallen into disuse in that country, have been preserved by it almost letter for letter. These Aryans from the Pamirs have lately been identified with the Pisâchas or "Ἀμφάγροι," who in later years became the subject of legend, and were looked upon, in the time of Sanskrit literature, as a race of demons.

## RESEARCH IN TERRESTRIAL MAGNETISM.<sup>1</sup>

THE Department of Research in Terrestrial Magnetism of the Carnegie Institution, if we may judge from its report for 1905, does not intend to let the grass grow under its feet. The work it has on hand at present comprises, *inter alia*, an examination, partly theoretical, by Dr. Bauer into the secular variation of terrestrial magnetism, a discussion of magnetic disturbances observed during the eruption of Mont Pelée, a general study of the laws of the diurnal variation, a special investigation into magnetic storms, and a discussion of magnetic observations made during the eclipse of the sun on August 30, 1905.

In some researches the cooperation of eminent foreigners has been secured. The investigation into magnetic storms, for example, is being prosecuted under the direction of Dr. Ad. Schmidt, of Potsdam. The scheme, however, which figures most largely on the programme for the immediate future is a magnetic survey of the North Pacific Ocean. Arrangements have been made for observations in countries adjacent to it, *e.g.* China, and a wooden sailing vessel, the brig *Galilee*, has been specially adapted for work at sea. The brig, of which a general idea will be

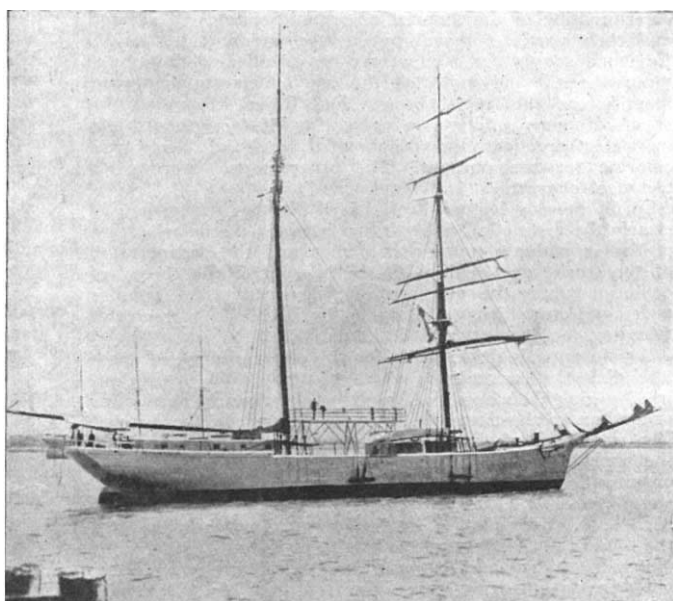


FIG. 1.—The *Galilee*.

obtained from the picture here reproduced, is of about 600 tons, and carries a crew of eleven in addition to magnetic observers. The bridge shown between the masts is intended to supply a specially favourable site for magnetic observations. The vessel has already made preliminary trips which are considered satisfactory.

The survey of the Pacific is primarily intended to furnish data for researches in which Dr. Bauer is interested, but the results should also be of immediate practical use in the improvement of charts. In addition to terrestrial magnetism, the department is providing for work in atmospheric electricity, and cooperation is intended with the new solar observatory of the Carnegie Institution, near Los Angeles, in studying the correlation between solar phenomena and terrestrial magnetism. With the financial support which the department enjoys, it may look forward to an important sphere of usefulness, especially if it concentrates its efforts, and prefers substantiality to rapidity of achievement.

There are other institutions in America, *e.g.* the Coast

<sup>1</sup> Report of Department of Research in Terrestrial Magnetism, by L. A. Bauer, Director. Extracted from the Fourth Year-book of the Carnegie Institution of Washington. (Washington, D.C., 1906.)